

THE GLOBAL WOOD SPECIES PRIORITY LIST: A LIVING DATABASE OF TREE SPECIES MOST AT RISK FOR ILLEGAL LOGGING, UNSUSTAINABLE DEFORESTATION, AND HIGH RATES OF TRADE GLOBALLY

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Abstract. The illegal timber trade is one of the most impactful natural wildlife crimes, affecting the livelihood of local communities, natural resource availability, and the associated carbon storage and biodiversity. Many timber species are highly sought after and are at risk of exhaustion and subsequent extinction. Although several initiatives exist to indicate tree species risk and conservation status, there is no single resource, or prioritized list, that qualifies the most high-risk and highly traded species across the globe. Organizations end up creating their own priority species lists to meet this lack of aggregated information, requiring hours of independent research and resulting in the recreation of similar lists. To provide a one-stop-shop for similar initiatives, World Forest ID developed the Global Priority Wood Species List (GPWSL) to synthesize existing information. Currently, the GPWSL harbors 270 species most at risk for illegal logging, unsustainable deforestation, and high rates of international trade. The database contains relevant information on each species; such as natural distribution, conservation listings, and countries of import. Here, we present the list, the methods used in its development, and its potential applications for the wood industry as a whole.

Keywords: Illegal timber trade, deforestation, conservation, tree species priority, illegal logging.

INTRODUCTION

Forests cover 31% of the Earth's land surface (4.06 billion hectares) (FAO and UNEP 2020), with approximately half of the world's forests being at high-risk for deforestation or degradation by 2030 (WWF 2022). Since 1990, 420 million hectares of forests have been lost worldwide, which equates to around 10% of the world's remaining forest coverage (FAO 2020). From 2015

to 2020, global deforestation averaged 10 million hectares each year (FAO and UNEP 2020). The conversion of forests to other land use forms (whether human-induced or not) has caused 420 million hectares of forest to be lost by deforestation since 1990 (FAO and UNEP 2020). The degradation of forests leads to a decline in ecological function and ecosystem services provided to humans and the planet. Society both benefits from and is highly dependent on forest ecosystems, both in monetary and nonmonetary terms. It is estimated that over half of the world's Gross

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Domestic Product (GDP) depends upon ecosystem services, with the forestry sector specifically contributing more than 1.52 trillion USD (directly, indirectly, and induced, in 2015) to the world's GDP and employing 33 million people globally (FAO 2022). Additionally, forests are critical for mitigating climate change, both directly through storing an estimated 662 billion tons of carbon, which is more than half the global carbon stock in soils and vegetation, and indirectly through their contribution to ecosystem processes (FAO 2022).

Following the 26th meeting of the UN Climate Change Conference of the Parties (COP26), also known as the "Glasgow Climate Pact," there is an increased focus on the critical role forests play in modulating the Earth's climate. Wood makes up the largest part of a forest's biomass, and the global estimate of carbon stored in these lignified tissues is upwards of 400 petagrams (Chave et al 2009; Beeckman 2016). At COP26, forests were recognized for this crucial role as global carbon sinks. Deforestation, however, can convert forests from carbon sinks to carbon sources as the carbon once stored in tree biomass and forest soil enters the atmosphere (Gatti et al 2021). Deforestation across the globe contributes 12-15% of worldwide greenhouse emissions, according to 2017 estimates (May 2017). Several commitments to forest conservation were made at COP26, such as the "Declaration on Forests and Land Use" calling for the halting and reversal of forest loss by 2030 (GOV.UK 2021). Additionally, the "Forest, Agriculture, and Commodity Trade Statement" was designed to deliver sustainable trade and reduce pressure on forests (GOV.UK 2021). This includes climate-conscious supply chain action by the largest companies trading in forest-risk commodities (GOV.UK 2021).

Despite these COP26 commitments, unsustainable deforestation and illegal logging remain global issues that threaten the Earth's climate and people. Forest legality remains one of the greatest and most complex barriers to conserving the world's forests. Understanding and mapping trade flows of timber and wood-based products is difficult due to the complexity of determining the legality of a

harvested tree. This determination can depend on a multitude of factors, such as species identification, export quotas, concession boundaries, and legal ownership of land. On top of this, once harvested, legal and illegal trees are often mixed, transported to a processing plant in a different country, and exported as forest products to yet another country. Additionally, trade documents can be falsified and products can be mislabeled to avoid legal repercussions. Such issues do not occur at an insignificant scale, as the annual trade value of illegal forest products is estimated at 52-157 billion USD (May 2017). Thus, the capacity to verify harvest origin and species is essential given the length and complexity of the supply chain.

It remains a challenge to verify the sustainability of internationally harvested forest products. International regulatory policies, such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the United States Lacey Act, and European Union Timber Regulation (EUTR) require targeted efforts to ensure the legality of timber supply chains. Consequently, entities involved in the global timber trade and wood industry need to understand which species and supply chains are threatened by illegality and unsustainable deforestation. A wood products' species identity and harvest origin can be determined using a variety of scientific methods. These techniques include wood anatomical analysis (manual and machine vision, see Gasson [2011] and Hermanson et al [2019]), Direct Analysis in Real Time—Time-of-Flight Mass Spectrometry (DART-TOFMS, see Deklerck & Price et al [2021]), DNA analysis (barcoding, fingerprinting, etc., see Jiao et al [2020]), and Stable Isotope Ratio Analysis (SIRA, see Watkinson et al [2022]). Each of these techniques, however, require reference data against which a product can be matched. World Forest ID (worldforestid.org) is a nonprofit organization building the world's largest georeferenced library of tree samples. World Forest ID aims to independently enable the identification of a forest product's species and harvest origin (Gasson et al 2021). As this reference library develops, there is a need to prioritize the species that are

most at risk of entering the supply chain illegally and face high rates of deforestation.

A key question, thus, for those in the forest legality field is, “which timber species should be prioritized for protection and close monitoring?” Existing publications and databases outline a general risk status (IUCN Red List of Threatened Species), high-risk genera in specific geographic regions (WWF 2015), and comprehensively list every timber species traded internationally (Mark et al 2014). However, there is no single resource quantifying the most high-risk and highly traded species across the globe. High-risk and highly traded species are those that require the most protection to avoid forest exhaustion and species extinction. Although the IUCN Red List is a crucial resource for quantifying the world’s most threatened wildlife species, some IUCN tree assessments can be outdated. Thus, it is possible that some tree species are in a worse state than their IUCN-assessed threat level. Additionally, the IUCN Red List only takes natural extinction risk into account, factoring out plantation efforts.

To meet the need for an aggregated list of priority timber species across organizations, World Forest ID began a database to collect and organize those species most at risk for illegal logging, unsustainable deforestation, and high rates of trade globally. The list will not only benefit World Forest ID work streams, but also other organizations in the field with adjacent interests.

METHODOLOGY

The effort began with compiling information from peer-reviewed publications, web databases, and experts in the field. It became clear that the compilation of up-to-date risk species is a common need amongst many organizations and forest legality experts. The database then spread to other actors with a need for prioritizing timber species and became a collaborative effort. Now, the Global Priority Wood Species List (GPWSL) harbors nearly 300 species and contains relevant information on each, such as natural distribution, conservation listings, and countries of import.

The list relies on scholarly trusted sources, such as government and non-governmental organization (NGO) reports to provide this information. Priority species must meet one or more of the following criteria to be added to the list: 1) illegal logging risk, 2) high trade internationally, or 3) threat of unsustainable harvesting. Whether a species fits one or more of the criteria is determined by reviewing the literature in which the species is found to be a priority; WWF (2015), Groves and Rutherford (2015), Environmental Investigation Agency (2017), Cramm and Van Brusselen (2019), Crowley et al (2020), Preferred by Nature (2020) and Bartholomew et al (2021). All three criteria were set in the interest of forest conservation and ensuring legality in the global forest product supply chain. Given that prioritization can be looked at through many lenses, it is important that the information in the GPWSL reflects this diversity in interests within the field.

The following information is filled in for each priority species, to the best of a contributor’s ability and resource availability: scientific name, common name, country of interest, vulnerable forest(s), natural distribution, commercial plantation(s), CITES listing, IUCN Red List category, alternate scientific name(s), internationally traded (Yes/No/Banned), likely product form traded, and import countries. The details and explanation of each of these can be found in Table 1. For each of these categories, the source, where the information was found, is noted. Sometimes, there is just one source from which all the inputted information was derived. If this is the case, then only that source will be noted for the species in question. For example, *Abies guatemalensis* was found to be a priority species from the CITES and Timber report published in 2015 (Groves and Rutherford 2015). This report also provides additional information on natural distribution and commercial plantations. Thus, the CITES and Timber report was indicated as the sole source for *Abies guatemalensis*. It is critical that each contributor to the list indicates the source from which the information inputted for a species came. Given that users come from many perspectives, one entity may look into a source and

Table 1. The fields of the Global Priority Wood Species List; Note: This working list is constantly updated so some sources may not be included.

Name	Unique six-character species identifier composed of the first three letters of the genus, followed by the first three letters of the species. (e.g., <i>Cedrela odorata</i> is CEDODO)
Genus	First word of scientific name (e.g., <i>Cedrela</i>).
Species	Second word of scientific name (e.g., <i>odorata</i>). If information was only available to the genus level, spp. will be noted for the species field.
Common name	A name, or names, other than the scientific name, that is commonly used to describe the species. Common names often differ by country or region. Sources include, but are not limited to IUCN Red List (2021); WWF (2015); and expert knowledge.
Country of interest	The country, or countries, in which the particular species is either 1) highly exported from, 2) at risk for illegal logging, or 3) at risk for unsustainable deforestation (using ISO Alpha-3 Country Codes). From WWF (2015), Preferred by Nature (2020), Groves and Rutherford (2015), Bartholomew et al (2021), and Crowley et al (2020).
Vulnerable forests	The country, or countries, in which the particular species' conservation is threatened. The species is either 1) at risk for illegal logging or 2) at risk for unsustainable deforestation based on literature evidence (using ISO Alpha-3 Country Codes). From WWF (2015), Preferred by Nature (2020), Groves and Rutherford (2015), Bartholomew et al (2021), and Crowley et al (2020).
Natural distribution	The country, or countries, in which the species naturally grows (using ISO Alpha-3 Country Codes). From WWF (2015), Cramm and Van Brusselen (2019), and Groves and Rutherford (2015). Verified using Plants of the World Online Kew Science .
Commercial plantations	The country, or countries, in which there are commercial plantations outside of the natural range (using ISO Alpha-3 Country Codes). From Groves and Rutherford (2015), Bartholomew et al (2021), and Crowley et al (2020).
CITES listing	Appendix in CITES from https://checklist.cites.org/#/en
IUCN red list	IUCN red list category from https://www.iucnredlist.org/
Alternate scientific name	Alternative scientific names that are no longer accepted, based on Plants of the World Online Kew Science determinations.
Internationally traded	Assessment whether this species is/has been known to be internationally traded (Y = Yes; N = No; B = Banned); Data on whether the species is traded internationally was based on findings of Mark et al (2014), but also incorporates independent non-governmental organizations (NGOs) and industry expert understandings.
Likely product form(s) traded	If "Internationally_Traded_Y_N_B" = Y, then this field provides a subjective assessment or evaluation of the known product forms the species is often traded in (e.g., it may be exported in raw log form to a processing country, but then after being processed in the intermediate country, it may be exported as veneer or finished flooring, so this field would read: logs, veneer, flooring).
Import countries	If "Internationally_Traded_Y_N_B" = Y, then this is a manually curated field that provides the list (using ISO Alpha-3 Country Codes) of the known countries that import the species in any of its potential product forms. Sources for this type of information include NGO reports (like Norman and Zunino 2022), and ITTO's Tropical Timber Market Reports (https://www.itto.int/market_information_service/)
Source	Source of the information in preceding fields
Notes	Additional notes
Reason for inclusion	Answers the question; why was the species included? (e.g., is it commonly illegally logged, highly traded globally, or does it grow in a country facing high deforestation? . . .)
Date last edited	Date any field in the row was last edited by a contributor.
Contributor	Person(s) who added information to any of the columns in the species of interests' row and the organization they are from (can be abbreviated after first input; e.g., Sarah Richardson, World Forest ID, will then be abbreviated to SR).

agree that the species is a priority for their purposes while another may choose to omit this species for their purposes.

SUMMARY OF THE GLOBAL PRIORITY WOOD SPECIES LIST

As of the writing of this article, the list is made up of 270 species, comprising 112 genera (Table 2). The species on the list have natural distributions covering 180 countries (Fig 1). The *Shorea* genus is leading the list, with a total of 23 species included. Second is the genus *Dalbergia*, with 19 species included. Southeast Asia is the region with the highest number of species included, largely due to the number of *Shorea* species that grow there. Other regions with a high number of species included are Amazonia and the Congo Basin. Unsurprisingly, these regions match up with the presence of tropical forests, known to be the hot-spots of illegal and unsustainable logging. It is important to note that a large number of priority species is not the only factor in establishing hot-spots. A region may have few priority species while exporting these species at large volumes. Such is the case in Eastern Europe, indicating that the number of priority species in a country does not equal trade flow volume. Figures 2 and 3 show a percentage distribution comparison between the IUCN Red List Status/CITES Appendices and the GPWSL. Most species included in the GPWSL are indicated as Least Concern or Endangered under the IUCN Red List. This is likely due to the limited trade in Critically Endangered species as there are little individuals left. Looking at the comparison with the CITES Appendices, we see that most species included in the GPWSL are not CITES listed. There are important distinctions in the evaluation criteria for inclusion in CITES and IUCN, particularly with respect to whether the threat to a species can be linked to international trade (Challender et al 2019). The GPWSL seeks to identify species that are traded regularly and are either not yet of relative concern such that they have yet to be CITES listed and are evaluated as Least Concern under the IUCN Red List, or are still traded and are of such high priority concern

that they are listed as Endangered under the IUCN Red List.

APPLICATIONS

The purpose of the GPWSL is to provide a general overview of each timber species deemed a global priority. An organization working on a specific project may then use the information in the list to create a more specified list for their purposes. This allows for the simplification of the list and for further detailing if desired for individual project requirements and questions being asked by an organization.

Perhaps the most important component of the GPWSL is its current and future applications within the field of timber legality and forest conservation. The array of information provided for each species on the list is intended to meet a broad assortment of needs. One of those practical applications recalls the original purpose of the list, to prioritize the species and locations sampled in World Forest ID collections. However, the list can also be used to answer questions related to timber trade and business. Additionally, there is a potential for the list to be used as a tool by other tree species databases, and vice versa. Following are several already utilized, and potential, applications of the GPWSL.

World Forest ID

Given that the list was born out of a need to prioritize species for World Forest ID collections, it is important to note the number of the listed species that have been sampled by World Forest ID at this point. Out of the 270 species listed, World Forest ID has collected 78 (at time of writing - June 2022). The remaining species, and those that may be added to the list in the future, can be used to further prioritize World Forest ID sample collections. World Forest ID typically organizes collections by country, meaning that the list can be used to pull all species naturally growing in the country or region of interest.

Table 2. The species included in the Global Priority Wood Species List (current as of June 2022).

Genus	Species	Genus	Species
<i>Abies</i>	<i>guatemalensis</i> , <i>nordmanniana</i>	<i>Hopea</i>	<i>aequalis</i> , <i>altocollina</i> , <i>centipeda</i> , <i>depressinerva</i> , <i>enicosanthoides</i> , <i>ferrea</i> , <i>helferi</i> , <i>longirostrata</i> , <i>megacarpa</i> , <i>micrantha</i> , <i>obscurinerva</i> , <i>odorata</i> , <i>rudiformis</i> , <i>vacciniifolia</i>
<i>Acacia</i>	<i>auriculiformis</i> , <i>mangium</i> , <i>mearnsii</i> , <i>melanoxyton</i>	<i>Huberodendron</i>	<i>patinoi</i>
<i>Acer</i>	<i>binzayedii</i> , <i>fenzelianum</i> , <i>mazandaranicum</i> , <i>pictum</i> , <i>pseudosieboldianum</i>	<i>Humiriastrum</i>	<i>procerum</i>
<i>Aesculus</i>	<i>hippocastanum</i>	<i>Hura</i>	<i>crepitans</i>
<i>Azelia</i>	<i>africana</i> , <i>bella</i> , <i>bipindensis</i> , <i>pachyloba</i> , <i>quanzensis</i> , <i>xylocarpa</i>	<i>Hymenaea</i>	<i>courbaril</i> , <i>oblongifolia</i> , <i>parviflora</i>
<i>Allantoma</i>	<i>decandra</i>	<i>Intsia</i>	<i>bijuga</i> , <i>palembanica</i>
<i>Amburana</i>	<i>cearensis</i>	<i>Julbernardia</i>	<i>pellegriniana</i>
<i>Anadenanthera</i>	<i>Colubrina</i>	<i>Khaya</i>	<i>anthotheca</i> , <i>grandifoliola</i> , <i>ivorensis</i> , <i>senegalensis</i>
<i>Androstachys</i>	<i>johnsonii</i>	<i>Leplaea</i>	<i>cedrata</i>
<i>Aniba</i>	<i>perutilis</i> , <i>rosodora</i>	<i>Liriodendron</i>	<i>tulipifera</i>
<i>Anisoptera</i>	<i>costata</i> , <i>reticulata</i>	<i>Lophira</i>	<i>alata</i>
<i>Apuleia</i>	<i>leiocarpa</i>	<i>Lovoa</i>	<i>trichilioides</i>
<i>Aquilaria</i>	<i>malaccensis</i>	<i>Machaerium</i>	<i>scleroxylon</i>
<i>Araucaria</i>	<i>angustifolia</i> , <i>araucana</i>	<i>Manilkara</i>	<i>bidentata</i> , <i>huberi</i> , <i>zapota</i>
<i>Aspidosperma</i>	<i>excelsum</i> , <i>macrocarpon</i>	<i>Mezilaurus</i>	<i>itauba</i>
<i>Aucoumea</i>	<i>klaineana</i>	<i>Microberlinia</i>	<i>bisulcata</i> , <i>brazzavillensis</i>
<i>Austranella</i>	<i>congolensis</i>	<i>Milicia</i>	<i>excelsa</i> , <i>regia</i>
<i>Bagassa</i>	<i>guianensis</i>	<i>Millettia</i>	<i>laurentii</i>
<i>Baillonella</i>	<i>toxisperma</i>	<i>Myroxylon</i>	<i>balsamum</i>
<i>Berlinia</i>	<i>confusa</i>	<i>Nauclea</i>	<i>diderrichii</i>
<i>Calophyllum</i>	<i>brasiliense</i> , <i>inophyllum</i> , <i>peekelii</i> , <i>soulattri</i>	<i>Neobalanocarpus</i>	<i>heimii</i>
<i>Camptosperma</i>	<i>brevipetiolata</i>	<i>Ormosia</i>	<i>coccinea</i> , <i>macrocalyx</i>
<i>Cariniana</i>	<i>pyriformis</i>	<i>Osyris</i>	<i>lanceolata</i>
<i>Cedrela</i>	<i>fissilis</i> , <i>odorata</i> , <i>salvadorensis</i> , <i>tonduzii</i>	<i>Paubrasilia</i>	<i>echinata</i>
<i>Cedrelinga</i>	<i>cateniformis</i>	<i>Peltogyne</i>	<i>purpurea</i>
<i>Ceiba</i>	<i>pentandra</i>	<i>Pericopsis</i>	<i>elata</i>
<i>Centrolobium</i>	<i>microchaete</i>	<i>Picea</i>	<i>abies</i>
<i>Cotylelobium</i>	<i>burckii</i>	<i>Pilgerodendron</i>	<i>uviferum</i>
<i>Couma</i>	<i>macrocarpa</i>	<i>Pinus</i>	<i>ayacahuite</i> , <i>koraiensis</i> , <i>leiophylla</i> , <i>montezumae</i> , <i>patula</i> , <i>pseudostrobis</i> , <i>sylvestris</i> , <i>teocote</i>
<i>Couratari</i>	<i>guianensis</i>	<i>Platymiscium</i>	<i>parviflorum</i>
<i>Cunninghamia</i>	<i>lanceolata</i>	<i>Plectrocarpa</i>	<i>sarmiento</i>
<i>Cylicodiscus</i>	<i>gabunensis</i>	<i>Podocarpus</i>	<i>neriifolius</i> , <i>parlatorei</i>
<i>Cyrtophyllum</i>	<i>fragans</i>	<i>Pometia</i>	<i>pinnata</i>
<i>Dacryodes</i>	<i>buettneri</i>	<i>Porlieria</i>	<i>angustifolia</i>

(continued)

Table 2. The species included in the Global Priority Wood Species List (current as of June 2022). (cont.)

Genus	Species	Genus	Species
<i>Dalbergia</i>	<i>annamensis, assamica, bariensis, baronii, cochinchinensis, cultrata, fusca, greveana, latifolia, louvelii, madagascariensis, maritima, monticola, nigra, oliveri, pervillei, rimosa, sissoo, tonkinensis</i>	<i>Prioria</i>	<i>balsamifera, copatifera</i>
<i>Didelotia</i>	<i>africana</i>	<i>Prunus</i>	<i>africana</i>
<i>Diospyros</i>	<i>ferrea, mcphersonii</i>	<i>Pterocarpus</i>	<i>erinaceus, macrocarpus, santalinoides, santalinus, soyauxii, tinctorius</i>
<i>Dipterocarpus</i>	<i>alatus, costatus, cuspidatus, fusiformis, geniculatus, glabrigemmatus, lamellatus, littoralis, macrocarpus, ochraceus, tempehes, tuberculatus</i>	<i>Pterogyne</i>	<i>nitens</i>
<i>Dipteryx</i>	<i>ferrea, micrantha, odorata, oleifera</i>	<i>Pycnanthus</i>	<i>angolensis</i>
<i>Dracontomelon</i>	<i>dao</i>	<i>Quercus</i>	<i>alba, bicolor, frainetto, mongolica, montana, petraea, robur</i>
<i>Dryobalanops</i>	<i>aromatica, fusca, rappa</i>	<i>Shorea</i>	<i>alutacea, biawak, brunnescens, calcicola, cordata, dispar, domatiosa, elliptica, foraminifera, iliasii, inaequilateralis, induplicata, laevis, leprosula, pachyphylla, pallidifolia, platyclados, praestans, revoluta, rotundifolia, splendida, tenuiramulosa, woodii</i>
<i>Entandrophragma</i>	<i>angolense, candollei, cylindricum, utile</i>	<i>Staudtia</i>	<i>kamerunensis</i>
<i>Erisma</i>	<i>uncinatum</i>	<i>Swietenia</i>	<i>macrophylla</i>
<i>Erythrophleum</i>	<i>fordii, ivornese, suaveolens</i>	<i>Tabebuia</i>	<i>aurea, rosea</i>
<i>Eucalyptus</i>	<i>delegatensis, globulus, grandis, obliqua, regnans</i>	<i>Taxus</i>	<i>wallichiana</i>
<i>Eusideroxylon</i>	<i>zwageri</i>	<i>Tectona</i>	<i>grandis</i>
<i>Fagus</i>	<i>sylvatica</i>	<i>Terminalia</i>	<i>brassii</i>
<i>Fitzroya</i>	<i>cupressoides</i>	<i>Theobroma</i>	<i>cacao</i>
<i>Fraxinus</i>	<i>excelsior, mandshurica, pennsylvanica</i>	<i>Tieghemella</i>	<i>africana, heckelii</i>
<i>Gilbertiodendron</i>	<i>dewevrei</i>	<i>Tilia</i>	<i>amurensis, mandshurica</i>
<i>Gonopterodendron</i>	<i>sarmientoi</i>	<i>Triplochiton</i>	<i>scleroxylon</i>

(continued)

Table 2. The species included in the Global Priority Wood Species List (current as of June 2022). (cont.)

Genus	Species	Genus	Species
<i>Guaiacum</i>	<i>coulteri</i> , <i>officinale</i> , <i>sanctum</i> , <i>unijugum</i>	<i>Ulmus</i>	<i>parvifolia</i>
<i>Guibourtia</i>	<i>coleosperma</i> , <i>demeusei</i> , <i>ehie</i> , <i>pellegriniana</i> , <i>tessmanni</i>	<i>Vachellia</i>	<i>macracantha</i>
<i>Handroanthus</i>	<i>albus</i> , <i>heptaphyllus</i> , <i>impetiginosus</i> , <i>incanus</i> , <i>serratifolius</i>	<i>Vatica</i>	<i>adenanii</i> , <i>cauliflora</i> , <i>chartacea</i> , <i>congesta</i> , <i>endertii</i> , <i>globosa</i> , <i>patentinervia</i> , <i>pentandra</i> , <i>rotata</i> , <i>rynchocarpa</i>
<i>Heritiera</i>	<i>littoralis</i>	<i>Vitex</i>	<i>cooperi</i>
<i>Hesperocyparis</i>	<i>lusitanica</i>	<i>Xylocarpus</i>	<i>xylocarpa</i>

International Trade

The GPWSL can also be used to inform and craft trade policies and regulations. The list can assist and educate the broader wood industry community in determining species risk and geographic origin. The species identification, along with additional information, such as likely product forms traded, can help inform sustainable development of timber trade and business.

Product forms differ between harvest and finished product, and this information has been used to assist prioritization of the US Harmonized Tariff Schedule (HTS) revisions. The revisions of the HTS product nomenclature codes maintain more genus and species-specific breakout categories. The GPWSL has been used by several NGOs to build consensus on which genera are highest priority to enumerate through the HTS, and in which specific product categories priority genera or

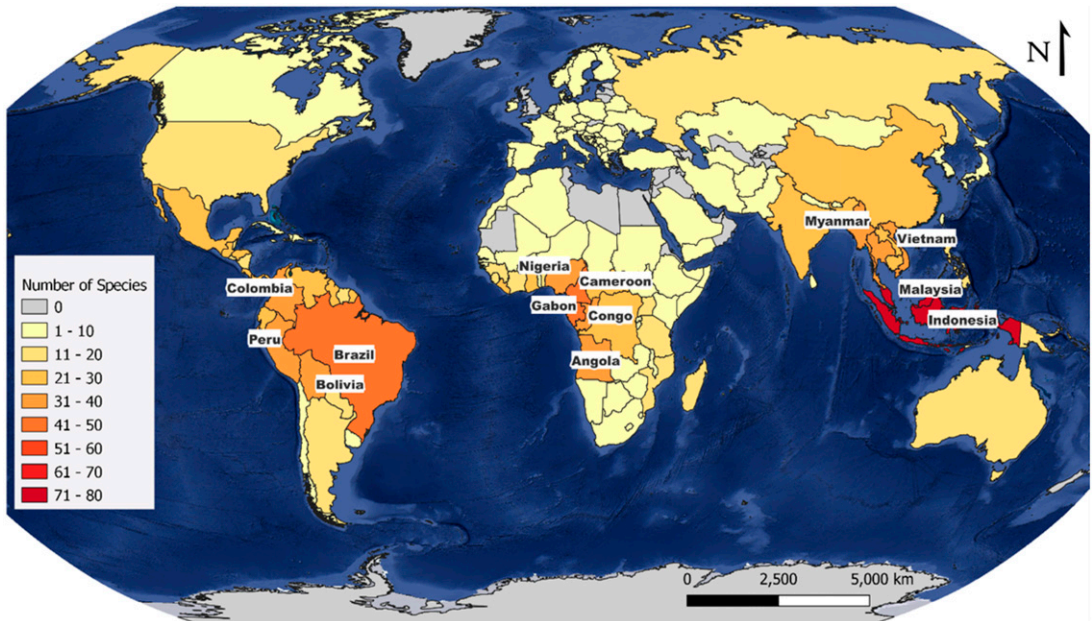


Figure 1. The number of species per country on the list, as represented by the natural distribution of each species. Countries with >31 species on the list are labeled.

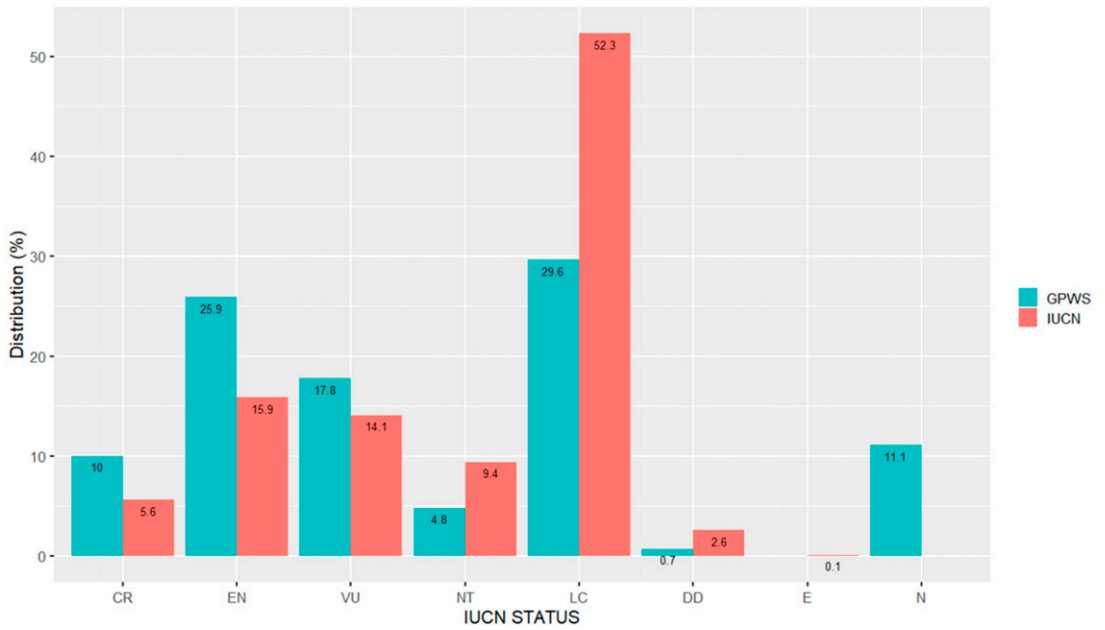


Figure 2. Distribution comparison of species included on IUCN and the Global Priority Wood Species List. CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern, DD = Data Deficient, E = Extinct, N = Not on IUCN Red List.

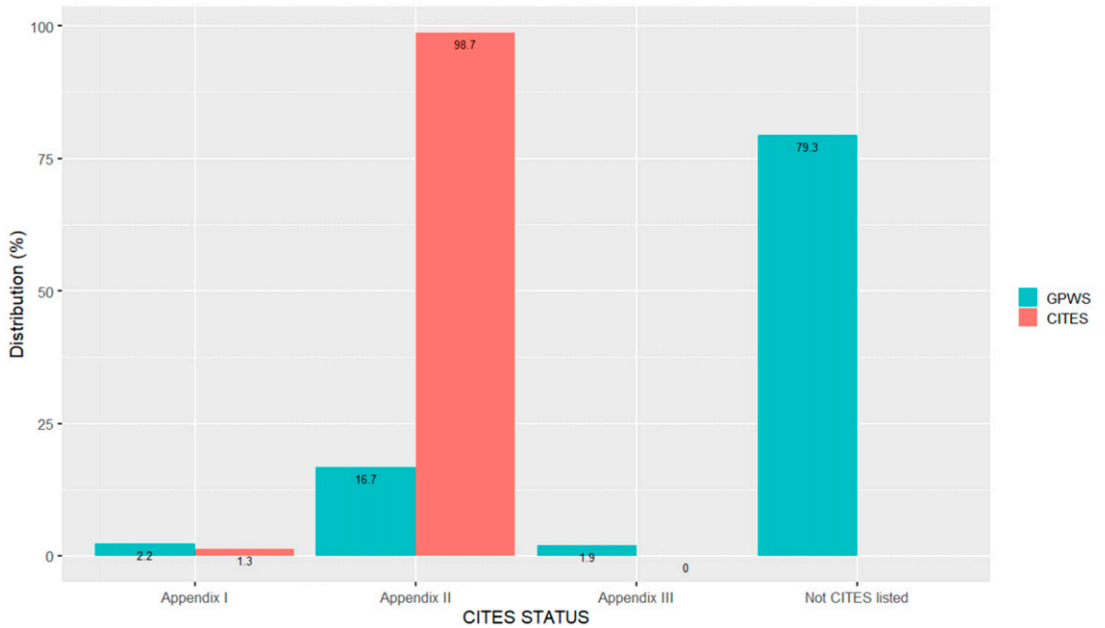


Figure 3. Distribution comparison of species included on CITES and the GPWSL.

species enumeration would be most impactful (Forest Trends 2022). Calls to increase species specificity in the global trade product nomenclature system, the harmonized system (HS), upon which the HTS is based, include high-risk wood species-product combinations (Norman and Zunino 2022), and extend beyond wood and plant species to include fish, seafood, and wildlife (Chan et al 2015; Cawthorn and Mariani 2017; Gephart et al 2019).

With respect to how this list can help the broader business community, the GPWSL is being used by organizations to build risk analysis tools and profiles. Companies can use the list to determine whether the species-countries they are sourcing from are of heightened risk or high conservation priority. Companies can also determine whether reference sample collections are present, or are prioritized for future collection efforts, thereby allowing them to know when sufficient reference data exists. This informs whether they can identify, verify, and track a given product's species and harvest origin through the supply chain using scientific identification methods and tools.

Database Harmonization

A variety of databases exist that provide detailed information on tree species used in timber. A harmonized database with all this information in one place would be a useful tool in the fields of forest legality and conservation. Thus, the GPWSL is created in the hopes that the information within can be utilized in other databases. Reversely, these relevant databases can ideally be utilized to supplement species information in the GPWSL. One example of such a database is Arbor Harbor, a developing platform that will compile reference information on tree species in the timber trade (<https://woodid.info/>). Comprehensive databases, such as Arbor Harbor, will be critical to improving the robustness of relevant information for each species in the GPWSL.

FUTURE OF THE LIST

The GPWSL is a living database, meaning that it is ever-changing and ever-adapting to the current

state of the world's tree species. Ideally, the species on this list would fall to zero with the work of the organizations involved. The prioritization of these species is intended for organizations to take this knowledge and use it to inform future practices. Whether that be through the increased transparency of the timber supply chain or the development of robust reference samples, all efforts influence the fight against illegal logging. However, the reality is that while some tree species may reach a status that would merit their removal from the list, others may be added. Some species that are not deemed a global priority now may end up becoming a priority in the future because of overharvesting and legality issues. Hopefully, the removal of species will surpass the addition of species in the coming years as progress in the field of forest legality is made.

The list can also be made a better resource by utilizing Application Programming Interfaces (APIs) to facilitate real-time updates to the global priority list. This would relieve the obligation of an individual going in and manually updating each of the fields after a selected period of time. These APIs can be sourced from web databases (e.g., IUCN Red List 2021 and CITES 2022) and hopefully from collaborating organizations, such as World Forest ID and Arbor Harbor. The number of collaborators will ideally grow in the future as more become interested in contributing and using the list. A wide range of expertise in the field of wood products and illegal logging is critical to this list as it can help the vetting and addition of species. Thus, it is important that contributors are brought in who can meet this diversity and improve the robustness and accuracy of the priority species. This list depends on a balance of give and take, rather than only serving as a resource to extract information from.

Access

If you or your organization would like to contribute to the GPWSL, please contact World Forest ID at info@worldforestid.org with; organization name, organization mission, organization's relation and relevancy to the purpose of the list, and the reason

why you or your organization would like to be a collaborator.

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